

# Weathering the Changes

## A living landscape in a changing climate

By Dr Tony Whitbread, Chief Executive Officer, Sussex Wildlife Trust



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Taking Care of Sussex



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# Introduction



**Dr Tony Whitbread**  
Chief Executive  
Sussex Wildlife Trust

Predictions regarding future climate change vary considerably. The great scientific consensus is that, whilst no one weather event can be attributed to climate change, the climate is changing and the most likely cause is human activity.

The broad pattern of change for this part of the planet is for warmer and drier summers, with milder, wetter winters. Increased storminess is also more likely with more extreme rainfall events, more windstorms and continuing sea level rise.

Climate change models, however, can only go so far. They may only apply at a large scale; effects at county level will be far less certain. We may not know the nature, extent or even direction of the likely changes at a Sussex scale. For example, while the rest of the world gets warmer it is possible, although unlikely, that changes in sea currents may make Sussex colder. We should have less rain in summer, but increased storminess may cause summer floods and, whilst we may hope for a benign

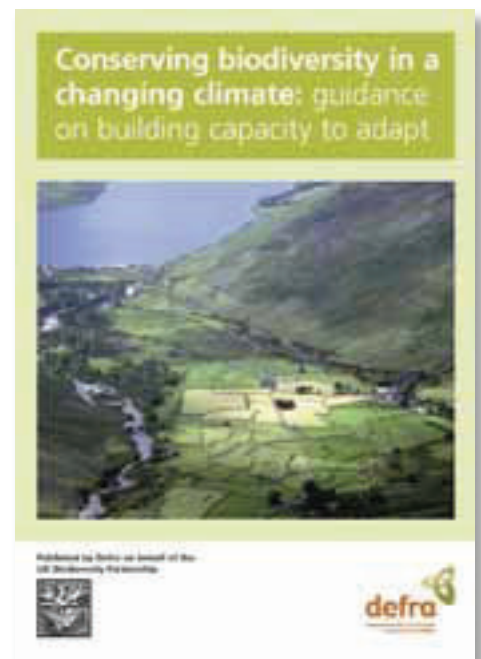


spotted flycatcher Kim Taylor/naturepl.com

change to warm, dry summers, we may in fact experience severe droughts and windstorms.

Furthermore it is likely that there will be an increase in unpredictability and variation from one year to another. There could also be the possibility of tipping points, flipping the climate into a new and unpredictable state.

However, the purpose of this document is not to examine the science of climate change or to investigate the likelihood of the different scenarios (for this visit the Intergovernmental Panel on Climate Change website: [www.ipcc.ch](http://www.ipcc.ch)). Its purpose is to present a strategy for the conservation of biodiversity in Sussex against the background of a changing climate.



**Wildlife could respond to climate change in a variety of ways:**

- Changes in the timings of seasonal events, leading to loss of synchrony between species and the availability of food, and other resources upon which they depend.
- Shifts in suitable climate conditions for individual species leading to change in abundance and range.
- Changes in the habitats that species occupy.
- Loss of habitats as conditions change (for example the drying up of wetlands), with the loss of the species in them.
- Changes to the composition of plant and animal communities.

It is likely, however, that the greater frequency of extreme weather events will have a greater impact on biodiversity than general changes in average conditions. It is also likely that the human response to climate change will have a far greater effect on biodiversity than the climate change itself.

Furthermore, whilst climatic zones may move several hundred kilometres north, many changes will occur at an extremely small scale. Similarly, changes in land management at a small scale could have a far greater effect on wildlife than major shifts in climate zones. (For example, heavy grazing of grassland allowing sunlight to penetrate the grass sward will increase the temperature of the soil surface far more than the predicted changes from climate change alone).

**A strategy for climate change must therefore present the best course of action to conserve nature against an unknown and unpredictable future.**

We therefore need a strategy that is based on improving adaptation, which means increasing the ability of natural systems to absorb and respond to change, whatever that change might be. In essence, a successful strategy must allow for uncertainty. Effective adaptation action should be beneficial whatever the extent, rate or direction of climate change.

However, even the most effective biodiversity strategy aimed at improving the adaptability of the environment will be overwhelmed if we do not take other action to address the underlying causes of climate change.



**This strategy is aimed at improving adaptability. There must also be other strategies aimed at significantly reducing the cause of climate change: our continually growing emissions of greenhouse gases.**

The Department for Environment, Food and Rural Affairs (Defra) has recently produced the document *Conserving Biodiversity in a Changing Climate: guidance on building capacity to adapt* (Hopkins et al, 2007).

[www.ukbap.org.uk/Library/BRIG/CBCCGuidance.pdf](http://www.ukbap.org.uk/Library/BRIG/CBCCGuidance.pdf)

This is an extremely helpful, well referenced document that can legitimately be used to form the basis of a local approach. This strategy draws heavily on this document.

Defra's guidance note details the following principles for a biodiversity strategy to address climate change and each of the six principles are expanded in the following pages:

- 1 Conserve existing biodiversity
- 2 Reduce sources of harm not linked to climate change
- 3 Develop ecologically robust and varied landscapes
- 4 Establish ecological networks through habitat protection, restoration and creation
- 5 Make sound decisions based on analysis
- 6 Integrate adaptation and mitigation measures into conservation management, planning and practice



# 1 Conserve existing biodiversity



bluebell wood Simon Colmer/naturepl.com

Future biodiversity can only adapt and evolve from the biodiversity that survives today so the importance of conserving current high quality sites cannot be overemphasised. These, however, cannot be preserved in aspic; change, including climate change will mean that habitats will change in their composition and structure with time.

## a) Conserve protected areas and other high quality habitats

In Sussex, protected areas Sites of Special Scientific Interest (SSSIs) Sites of Nature Conservation Interest (SNCIs) and Nature Reserves (NRs) cover about 11% of the county. High quality habitats also occur outside protected areas and these may be managed for purposes other than wildlife conservation. Examples in Sussex include a very high cover of ancient semi-natural woodland, hedgerows, grazing marshes, gills and rivers.

These areas have two important functions acting as core areas for biodiversity and as connecting habitats within ecological networks. The success of an ecological network will depend upon the existence of large populations in core areas, hence acting as centres for colonisation of surrounding areas.

## b) Conserve range and ecological variability of habitats and species

The risk of species and habitat loss will be less if a varied set of sites are conserved. With varied habitats, at a variety of scales, species may be able to move short distances, and habitats re-configure, with changing conditions. Therefore a varied set of sites should be conserved encompassing the full range of ecological conditions in which habitats and their constituent species occur.

Future ecosystems will only be able to develop from what survives from the present. Healthy populations of a diversity of species forming centres from which the surrounding environment can be colonised is the vital first step in the maintenance of an adaptable environment.

## Sussex Wildlife Trust Role

- Develop a strategic approach to site protection through the Sussex Biodiversity Action Plan. Ensure that plans encompass the range of ecological situations, seeking good representation of different habitats in Sussex, including atypical or unusual sites.
- Explain and interpret the value of high quality wildlife sites to create a demand for special places from people.
- Acquire, maintain, enhance and expand Sussex Wildlife Trust (SWT) nature reserves so they act as core areas for colonisation into the wider environment.
- Work in unison with other conservation organisations for the acquisition, conservation and unified management of existing high quality areas.
- Lobby for effective protection and management of key sites throughout the county.
- Work for effective conservation and management of key wildlife sites through influence of agri-environment schemes, methods of 'planning gain' and community action.
- Seek opportunities to create buffers of semi-natural habitat around high quality wildlife habitats.

## 2 Reduce sources of harm not linked to climate change

Wildlife may be less able to adapt to climate change if other sources of harm are present. Many of these may be out of our control but we should be aware of them.

- Abandonment of traditional management, such as neglect of woodland management or lack of grazing in grassland and heathland.
- Nutrient enrichment.
- Spread of non-native species.
- Agricultural intensification.
- Over abstraction of water.
- Aerial pollution.
- Habitat loss and fragmentation.

### Sussex Wildlife Trust Role

- Ensure in future reviews of the Sussex Biodiversity Action Plan that plans and projects identify and address non-climate causes of adverse change.
- Work to ensure that agri-environment schemes, forestry methods and other land management approaches reduce the above potential sources of harm.
- Promote robust protection of wildlife in strategic planning and in the strategies of government and non-government bodies.
- Implement effective management on our own nature reserves.
- Negotiate with landowners and land managers surrounding key sites to reduce causes of harm to key sites from surrounding land use.



Dried river bed [Adrian Davies/naturepl.com](https://www.naturepl.com)

# 3 Develop ecologically robust and varied landscapes

It is likely that landscapes will change in complex ways as a result of climate change. This may result in some habitats increasing or decreasing in size, changing in structure, appearing or disappearing. Maintaining a diversity of semi-natural habitats, increasing the area of semi-natural habitats, addressing the impacts of unsympathetic land uses and allowing natural processes to shape the ecology and structure of whole landscapes will create the best chance for biodiversity. Reducing the intensity of land use in intervening parts of the landscape will also increase the chance for species to move between high quality wildlife patches. Sussex is already a varied landscape, especially when compared to some other counties. However, variation is limited when compared to a possible natural situation.

## Conserve and enhance local variation within sites and habitats

The environment is a mosaic of habitat patches, the patches being surrounded



silver washed fritillary David Plummer

by both sub-optimal areas (that may allow dispersal but not long term survival) and by hostile areas. Each species requires its own range of habitat patches, the size of a required patch varying enormously from species to species.

### Example of within-site variation:

Woodlands are one of our most diverse habitats, made up of species that like shady conditions. Grasslands, on the other hand consist of species liking more open, sunny conditions. A matrix of woodland and grassland, with all the stages of regenerating scrub in between, provides a moving small scale network of different micro-habitats so that individuals that like open or shady conditions can simply move to a nearby area as climate changes. Thus diverse pasture woodland may offer an example of a wide range of possible conditions so species can move small distances within a site in response to changing climate.

Climate, for example, can vary enormously over very short distances, from inside a wood in deep shade to the open, sunny patches of grassland. Even two sides of a rock can have very different conditions. Where there is a wide diversity of habitat patches, species are more able to respond to climate change by relocating within the landscape they already occupy. Management approaches that give a more varied vegetation structure with a diversity of habitat patches are more likely to deliver a landscape that is ecologically robust to climate change.

Landscapes that are currently richest in wildlife are also more likely to be the more varied in terms of habitat diversity and so more likely to allow species to adapt by dispersing to nearby habitat patches. The following characteristics will be worth maintaining and enhancing:

- Diverse and structurally varied vegetation.
- Uninterrupted semi-natural habitat on a range of slope or aspect.
- Uninterrupted semi-natural habitat over a range of altitudes is not as relevant in Sussex as in upland areas although transitions on the Downland scarp, for example, could be important.
- Uninterrupted semi-natural vegetation across coastal zones.
- Diverse water regimes and a diversity of wetland conditions. These could be most valuable where open waters and wetlands are fed by combinations of surface drainage, ground water and aquifers.



## Sussex Wildlife Trust Role

Carry out vegetation management to give more varied vegetation structure. This can be done in a variety of ways but will include:

- Low intensity or naturalistic grazing and browsing regimes.
- Rotational vegetation cutting, with a variety of patch sizes and a variety of time intervals.

Carry out management to create a diversity of water regimes. This could include:

- Careful regulation of extraction and water flow, possibly with increasing water storage in and between sites, to create a diversity of conditions.
- Re-naturalisation of river catchments to encourage natural processes to create the diversity of conditions.
- Restore and create transitional habitats (such as scrub between grassland and woodland or fen/marshland between water and dry land) to increase variability of habitats and micro-climates.
- Seek opportunities to achieve the above in conjunction with other land managers to increase variation in the landscape.
- Seek opportunities to explain and interpret the value of varied vegetation structures to the wider public.



Amberly Wildbrooks Gerry Gavgan

## Make space for the natural development of rivers and coasts

Rivers, streams, gills and seas in Sussex have an important influence on wildlife through the processes of erosion and deposition. Halting erosion and deposition, stabilising rivers and coasts, canalising rivers and other artificial modifications of river courses reduces biodiversity and makes rivers and coast more vulnerable to sea level rise and flooding, both of which are more likely with climate change. The vast majority of the river courses and coastal zones in Sussex have been heavily modified making habitats and human settlement more vulnerable to change.

Making space for natural processes (flooding in the flood plain, natural meandering of rivers, erosion and deposition on coasts and along rivers etc) to take their course will be difficult as it will impact on other land uses. Nevertheless, opportunities should be sought. The role of re-naturalised coastal zones and flood plains in flood alleviation should help drive these changes.

## Sussex Wildlife Trust Role

- Seek opportunities to influence plans and strategies to encourage the natural development of coasts and rivers, such as River Basin Management Plans, the Sussex Biodiversity Action Plan, shoreline and coastal zone management plans, flood risk management plans and protected area management plans (for Areas of Outstanding Natural Beauty and National Parks).
- Encourage plans that retain or restore natural river profiles and floodplains, including the variety of their associated habitats, allowing erosion, deposition and natural flooding thereby increasing the potential for maintaining biodiversity while alleviating the risk of flooding. This could be achieved through the Trusts landscape projects, especially the Sussex Otters and Rivers Partnership project.
- Encourage the realignment or natural change of coastal defences to restore coastal habitats and transition zones between coastal and terrestrial habitats, so enhancing biodiversity while delivering more sustainable long term coastal defence.
- Campaign against plans for built development in or near flood plains and coastal areas that could compromise options for natural management of river systems, including wetland restoration on the floodplain.

# 4 Establish ecological networks through habitat protection, restoration and creation



barbastelle bat Frank Greenaway

Creating ecological networks to improve connectivity between habitat patches and allow species dispersal will enhance the resilience of the landscape and increase the probability of species surviving.

Sussex is fortunate in that it is not as fragmented as many lowland landscapes; there is more of a network to build on than in some places. Nevertheless, habitat isolation remains a problem for long term species survival; many habitat patches remain isolated through intensive intervening land use, development and infrastructure such as roads. Ecological networks should be established and strengthened by programmes of habitat restoration and creation to provide opportunities for dispersal across landscapes and between regions in response to climate change.

Effective links between habitat patches will enable a landscape to act more as one large unit from a wildlife perspective. Large units have a greater chance of containing more habitat variety within them, a greater ability to support viable populations of species and allow a greater ability for wildlife to spread throughout the landscape. The effective linking of core areas will be through activities such as habitat restoration and re-creation targeted to where there are concentrations of existing habitats. A network may therefore be created through a mixture of expansions and buffering around existing habitat patches, through the creation of stepping stones and broad corridors between sites and by a general improvement to the environmental quality of the wider landscape.

Critical to the development and value of ecological networks is, however, the conservation of existing areas of high quality wildlife habitat (principle 1). These will form core areas that will populate the rest of the network once connections are improved. Other types of activity are also required. Firstly to restore existing habitats that have become degraded through inappropriate management or neglect, and secondly to create new habitat, targeting it where there are greatest concentrations of existing semi-natural habitats.

An ecological network, however, is not a network of hard lines on maps, but broad areas where biodiversity objectives might best be achieved. It is a map of opportunity, not constraint, of concentrations of wildlife sites connected by linkages and buffer strips set in a broad Sussex landscape that is all more amenable to wildlife, nature and natural processes. Whilst a map is a useful guide, an ecological network is better considered as a broad principle that can be applied at any scale.

Habitat restoration and the creation of new habitats are both more resource intensive than conserving existing areas. Furthermore the opportunities for restoration and recreation (in terms of land use, land ownership and environmental characteristics) may be fairly limited. Nevertheless, Sussex, being less fragmented than some places, has more 'sub-optimal' habitat that could be enhanced. We also know



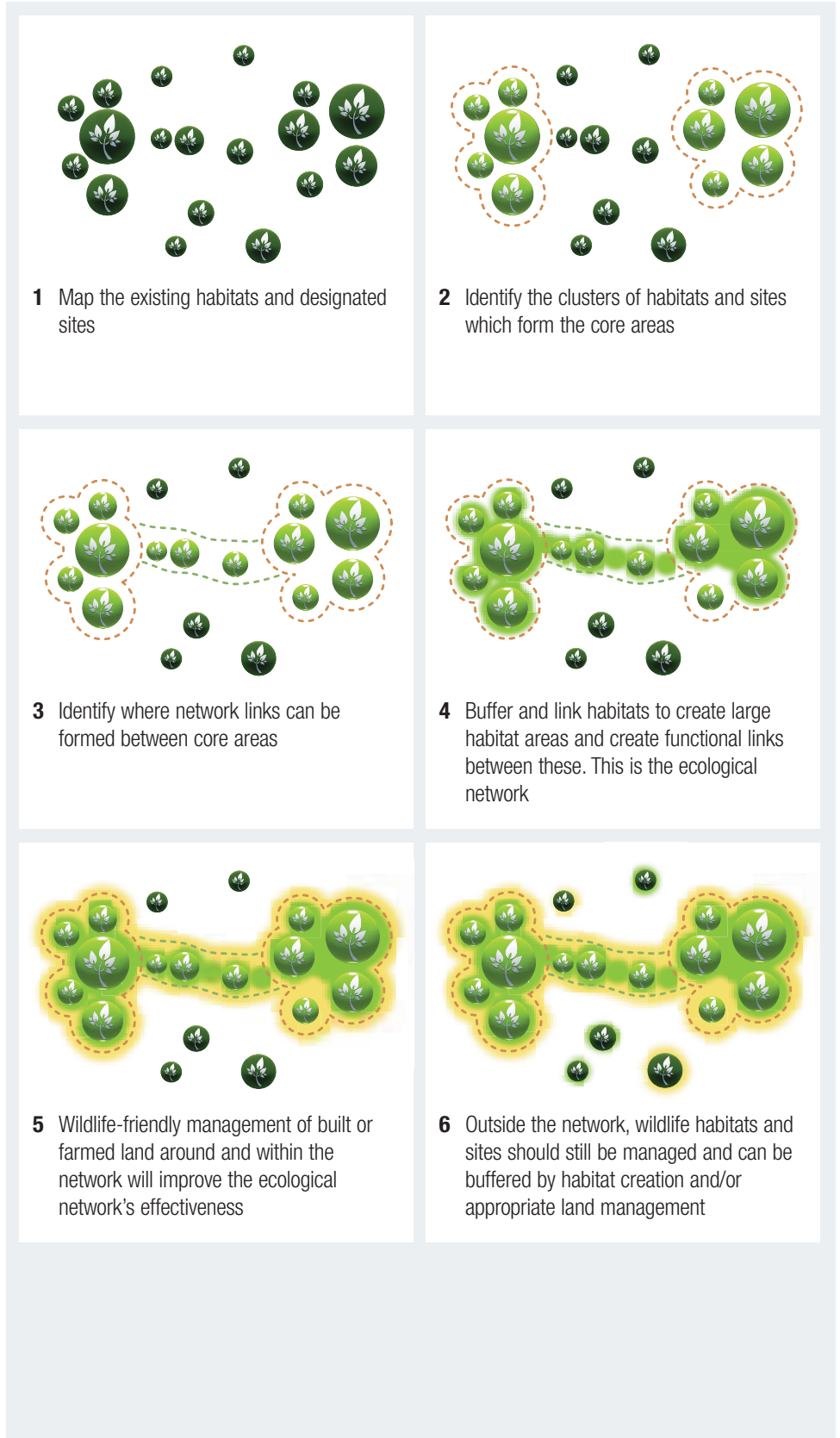
fly agaric Mark Monk-Terry

of landowners who may wish to contribute to an ecological network approach. Whilst opportunities may still be limited, a long term strategy for an ecological network is an important part of a climate change strategy and part of the reason behind current initiatives by the South East Wildlife Trusts who published *A Living Landscape for the South East* and the Sussex Wildlife Trust document to be published later this year *A Living Landscape for Sussex*.

It is, however, important to note that ecological networks can only enhance dispersal of some species; their development might reduce but not prevent biodiversity loss due to climate change.

### Sussex Wildlife Trust Role

- Produce a strategic document *A Living Landscape for Sussex* to promote an ecological network for Sussex.
- Promote the concept of ecological networks in the Sussex Biodiversity Action Plan.
- Lobby for the development and implementation of an ecological network approach in regional plans (such as the South East Plan), county and district strategies, local development frameworks, protected area management plans (for Areas of Outstanding Natural Beauty and National Parks), regional and sub-regional investment frameworks etc.
- Utilise the ecological network approach to assist with targeting of incentive schemes such as Environmental Stewardship and the Forestry Grant schemes.



# 5 Make sound decisions based on analysis

There is always more that can be learned about biodiversity and the way it might change with changing conditions. However, Britain probably has information systems that are as good as any in the world and Sussex has one of the best Biodiversity Record Centres in the country. Lack of information should not be an excuse for inaction. However, it is vital that research, survey and monitoring continues and that the results inform biodiversity conservation.

## Thoroughly analyse causes of change

Identifying and responding appropriately to declines of species caused by climate change is an important challenge to nature conservation. However, it is important that biodiversity loss is not seen as an unavoidable consequence of climate change. In many cases other factors, alone or in combination, will be more important causes of habitat degradation and species decline.

## Sussex Wildlife Trust Role

- Ensure reasons for change or decline in species and habitats are understood before assuming all change is due to climate change.
- Accept inevitable change in the distribution of species (even if this means loss from Sussex) when considering our management of nature reserves, the advice we give to others and the interpretation we provide to the wider public. For instance accept local decreases in a species if there is clear evidence of increases elsewhere in its range.
- Utilise existing, and establish new, long term monitoring schemes for species and habitats to follow the effects of climate change and provide information for management.
- Consider interventions to address declines in species. This may be appropriate and practicable only in certain situations. Translocations of keystone species may be one approach, though UK Joint Nature Conservation Committee (UK JNCC) guidance should be followed.



water vole monitoring

## Respond to changing conservation priorities

Nature conservation has traditionally prioritised the conservation of rare and threatened species and habitats. This has served nature conservation well and we now have a good system of site and species protection. Under a changing climate however, the range and abundance of many species will change.

For some species and habitats our current conservation measures may become redundant if climate change means they become more abundant. A warming climate may mean that species of a southern distribution could move northwards. Conversely, some currently common species may decline because of climate change so difficult decisions will have to be made about how much conservation effort should be put into species whose eventual loss from Sussex may be inevitable. As a result of these changes there will need to be reviews of conservation priorities in, for example, biodiversity action plans.

It is also possible that European species will colonise Britain whilst they could decline in mainland Europe. Britain may then become of international importance for these species and this again might affect UK conservation target setting.

Nevertheless climate change, especially on a small scale, could be highly unpredictable and the effects of climate change on any one area might be very variable. This variety and unpredictability may have a greater effect on biodiversity than a general trend of warming.



red-veined darter Premaphotos/naturedpl.com

## Sussex Wildlife Trust Role

Work with the Sussex Biodiversity partnership to adapt biodiversity targets in species and habitat action plans. This will include:

- Reduction of conservation effort on species becoming more common with climate change.
- A review of conservation effort for previously common species that become on the edge of their ranges as a result of climate change.
- Increase in conservation effort for species which, though possibly common in Britain, have become rare elsewhere as a result of climate change.
- Greater conservation priority given to reducing habitat fragmentation.

# 6 Integrate adaptation and mitigation measures into conservation management, planning and practice



coppiced hazel wood Adrian Davies/naturepl.com

Conservation management on individual sites has generally involved the identification of targets for habitats and species, then the application of protection and management approaches to effect their achievement. In the light of changing conditions, however, there is now a need to move from management largely focused on selected species and habitats towards an emphasis on the underlying physical and ecological processes that are essential to the maintenance of biodiversity on a site. These include:

- Water regimes, as droughts and unpredictable extreme events (such as flooding) may become more common.
- Fire control and management as habitats, some of which may not have been vulnerable in the past, become more prone to fire.
- Livestock management and cutting regimes as changes in growing seasons may change the availability

of fodder, may alter the type of grazing animal likely to be successful and may alter the timing of cutting regimes in order to deliver a biodiversity affect.

- Erosion and deposition of sediments from increased flooding in rivers and sea level rise on the coast.
- Increased control of alien species that may become invasive at an early stage in their establishment or spread.

In some cases these factors might be under the control of one land owner or manager – such as grazing and cutting regimes. Others, such as water management and control of alien species will need an integrated approach across several ownerships or applied at landscape or regional scale.

Carbon dioxide mitigation measures may become more of a feature of land use practices in the future. This is more likely to be applied in preventing carbon loss than to carbon sequestration. Most

of the terrestrial carbon in the UK is in the soil and measures to reduce modification of soils should be incorporated into management approaches. This may be more appropriate to the peat soils of the uplands than to Sussex; however, carbon storage in less disturbed soils in ancient woodland, long established grassland and wet heathland are still likely to be important considerations to land management.

Carbon dioxide mitigation in woodland management is more likely to be achieved through resource substitution rather than sequestration *A Strategy for England's Trees, Woods and Forests*. (Defra, 2007). This means that instead of growing trees for carbon storage, woodlands are grown and managed to provide resources, such as wood fuel, that substitute for more carbon intensive energy sources such as fossil fuel.

## Sussex Wildlife Trust Role

- Re-focus management of important wildlife sites (including our own nature reserves and other sites via the advice we give to others) to give higher consideration of underlying physical and ecological processes, with less emphasis on species and habitat targets.
- Emphasise habitat size, quality and inter-connectivity alongside the conservation of existing habitat patches (without de-valuing the importance of remaining high quality sites) in the advice to and influence of other organisations and people.
- Support and promote environmentally beneficial resource substitution approaches, for instance the use of wood fuel as an alternative to fossil fuels. This should only be done if there are appropriate checks and balances in place so that wood fuel is provided as a result of management approaches in appropriate woodlands sites that deliver biodiversity gain.

# Conclusions

There is a high degree of certainty in the scientific community that climate change is happening and that its cause is human activity. The nature, scale and direction of climate change is however, unpredictable at a Sussex scale. It is also likely that there will be increasing variability in local and seasonal weather patterns with possible large swings in conditions. Nevertheless, uncertainty about how climate change will unfold or how habitats and species will change must not prevent us from taking action.

A strategy for biodiversity conservation in the light of climate change is therefore needed that presents the best course of action to conserve nature against an unknown and unpredictable future. This means that we need to develop an environment that is robust to change, whatever change that might be.

Future biodiversity can only adapt and evolve from the biodiversity that survives today so the importance of conserving current high quality sites cannot be overemphasised.

Maintaining a diversity of semi-natural habitats, increasing the area and connectedness of semi-natural habitats, addressing the impacts of unsympathetic land uses and allowing natural processes to shape the ecology and structure of whole landscapes will create the best chance for biodiversity.

Furthermore this is an effective conservation strategy even if there was no climate change or if it was not caused by human activity. This strategy aims to deliver an adaptable, robust environment, an important approach independently of climate change.

Providing the best chance for biodiversity, as well as being a worthwhile objective in its own right, will also provide the best chance of maintaining a high quality environment that continues to provide the ecosystem services (such as



dormouse Colin Varrdell

flood amelioration, climate regulation, nutrient cycling and water purification) on which we all depend.

The Sussex Wildlife Trust will promote this strategy in all that it does, including guiding management and acquisition of nature reserves, informing our campaign work, the way we influence people and the way we communicate the importance of a healthy wildlife rich environment through education and to the wider public.

An important element of this strategy is the development of an ecological network for Sussex. This concept will be presented in the document *A Living Landscape for Sussex*, due to be published in 2008.

However, even the most effective biodiversity strategy will be overwhelmed if we do not take other action to address the causes of climate change: our continually growing emissions of greenhouse gases.

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**Sussex Wildlife Trust**  
Woods Mill, Henfield  
West Sussex BN5 9SD

Tel: 01273 492630  
Fax: 01273 494500

Email: [enquiries@sussexwt.org.uk](mailto:enquiries@sussexwt.org.uk)  
Website: [www.sussexwt.org.uk](http://www.sussexwt.org.uk)

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